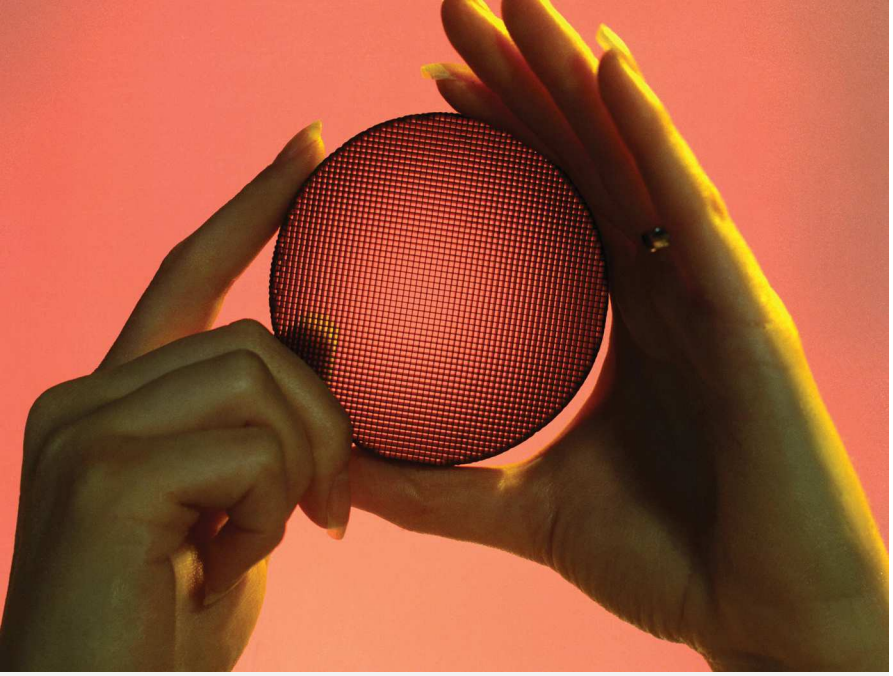

National Aeronautics and Space Administration

NASA

technology solution

Materials and Coatings

Low-Temperature Oxidation/ Reduction Catalysts

Catalytic oxidation of carbon monoxide, formaldehyde, and other hydrocarbons, and NOx reduction, in air and process gas streams

NASA Langley researchers, in work spanning more than a decade, have developed a portfolio of technologies for low-temperature gas catalysis. Originally developed to support space-based CO2 lasers, the technology has evolved into an array of performance capabilities and processing approaches, with potential applications ranging from indoor air filtration to automotive catalytic converters and industrial smokestack applications. The technology has been used commercially in systems that provide clean air to racecar drivers, as well as incorporated into commercially available filtration system for diesel mining equipment. Backed with extensive research on these technologies, NASA welcomes interest in the portfolio for other commercial and industrial applications.

BENEFITS

- Temperature range: room temperature to several hundred degrees Celsius
- Oxidation removal of CO, formaldehyde, and other lightweight hydrocarbons
- Can be formulated for reduction of NOx
- Standard treatment available for silica and cordierite ceramic substrates
- Sprayable formulations available for catalyst treatment onto a variety of other substrates and substrate forms
- No external heating or energy input required for operation
- Readily available materials and manufacturing methods
- Extensive history and experience at NASA for applications development and performance characterization

THE TECHNOLOGY

The low-temperature oxidation catalyst technology employs a novel catalyst formulation, termed platinized tin oxide (Pt/SnOx). The catalysts can be used on silica gel and cordierite catalyst supports, and the latest developments provide sprayable formulations for use on a range of support types and shapes. Originally developed for removal of CO, the catalyst has also proven effective for removal of formaldehyde and other lightweight hydrocarbons.

NASA researchers have also extended the capability to include reduction of NOx as well as developed advanced chemistries that stabilized the catalyst for automotive catalytic converters via the engineered addition of other functional components. These catalyst formulations operate at elevated temperatures and have performed above the EPA exhaust standards for well beyond 25,000 miles. In addition, the catalyst can be used in diesel engines because of its ability to operate over an increased temperature range.

For use as a gas sensor, the technology takes advantage of the exothermic nature of the catalytic reaction to detect formaldehyde, CO, or hydrocarbons, with the heat being produced proportional to the amount of analyte present.

The NASA technology has applications in automotive exhaust catalytic converters.

APPLICATIONS

The technology has several potential applications:

- Automotive exhaust catalytic converters
- Industrial process control
- Smokestack emission remediation
- Indoor air treatment
- Cabin air treatment
- Contained breathing systems
- Diesel operated machinery

PUBLICATIONS

Patent No: 7,655,595; 7,371,358; 6,753,293; 7,781,366; 6,132,694; 9,044,743; 7,390,768; 7,318,915; 7,985,709

More Information

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

LAR-17154-1, LAR-16001-1, LAR-15851-1-CU, LAR-17154-2, LAR-15652-1-CU, LAR-16308-2, LAR-16307-1-SB, LAR-16390-1-SB, LAR-16307-2